

MEAN LAKE LEVELS DURING JUNE, 1914.

The following data are as reported in the U.-S. Lake Survey "Notice to Mariners" dated Detroit, Mich., July 6, 1914:

Data.	Lakes.			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Mean level during June, 1914:				
Above mean sea level at New York.....	Feet. 602.49	Feet. 580.60	Feet. 573.04	Feet. 246.91
Above or below—				
Mean stage of May, 1914.....	+ 0.16	+ 0.28	+ 0.13	— 0.04
Mean stage of June, 1913.....	+ 0.13	— 0.00	— 0.83	— 1.11
Average stage for June, last 10 years.....	+ 0.19	— 0.47	+ 0.03	— 0.23
Highest recorded June stage.....	— 0.94	— 3.00	— 1.48	— 1.72
Lowest recorded June stage.....	+ 1.25	+ 0.70	— 1.47	+ 2.02
Probable change during July, 1914.....	+ 0.2	+ 0.10	— 0.1	— 0.1

FLOOD STUDIES AT LOS ANGELES.¹

By FORD A. CARPENTER, Local Forecaster.

[Dated, Weather Bureau, Los Angeles, Cal., Apr. 8, 1914.]

[An address before the southern California association of members of the American Society of Civil Engineers, Los Angeles, Cal., Apr. 8, 1914.]

Introduction.

The rainstorm of February 18-21, 1914, caused the most damaging but not the greatest flood in the history of Los Angeles. Railway and street traffic were interrupted for a period exceeding 24 hours, bridges and roadbeds were destroyed, the harbor was silted, and some ranches and orchards swept bare. The property loss probably exceeded \$3,000,000. This was offset many times over by the great amount of good this storm did in filling the depleted mountain reservoirs, raising the level of the valley ground water, and amply soaking the hundreds of thousands of acres of agricultural land in the Los Angeles district.

If such floods were matters of rare occurrence, and the resulting damage could not be prevented, then the monetary loss and the temporary inconvenience might be forgotten, or the "unusual" weather remembered as being among the rare occasions in southern California when meteorological conditions were not favorable. But such is not the case, as will be shown by the accompanying tables and charts recording weather conditions since the establishment of the local Weather Bureau station 37 years ago. The object of this present paper is to give some of the contributing causes of these floods in general, and of the last February storm in particular. It is also desired to set forth a brief history of past floods in Los Angeles and detail some of their pertinent features.

As is well known, there is but one reason for the production of rain, viz, condensation of atmospheric moisture far below the saturation point. In southern California this condensation is brought about primarily by the action of the eddying winds in a storm center and the attendant upward deflection of moisture-bearing winds. Owing to the general eastward drift of the earth's atmosphere in these latitudes, the air from the Pacific Ocean reaches us moist and of nearly constant temperature. Precipitation occurs in southern California whenever there is sufficient atmospheric disturbance to expand and cool the moisture-laden winds far below their dew point. This disturbing feature is almost invariably an aerial eddy, the familiar "low" of the weather map. Whenever the path of a low-pressure area extends as far south as latitude 40° N., precipitation results in this portion of the

State. The amount of the precipitation is determined generally by the blocking of a ridge of high pressure, which prevents the normal eastward drift of the storm area. It is thus seen that southern California would be practically rainless all of the time instead of more than half the year, were it not for the slight southward deflections of the paths of the northern storms.

An examination of a chart of annual rainfall shows remarkable variations in the amount and distribution of the seasonal fall. The rainfall in southern California is evidently one of the least dependable of meteorological elements. The irregularity of the seasonal rainfall is further shown by the wide difference between the normal annual rainfall of 15.5 inches at Los Angeles and the extremes of 5.6 inches (1898-99) and 38.2 inches (1883-84). As it is, rain occurs only during a fraction of the year. Los Angeles has an average of but 16 days with a quarter of an inch or more of rain and only 5 days with an inch or more.

Monthly distribution of precipitation.

In figure 1 the rainfall for each month is plotted around a center representing zero and circles are drawn for each inch of rainfall. The radials are the months of the year.

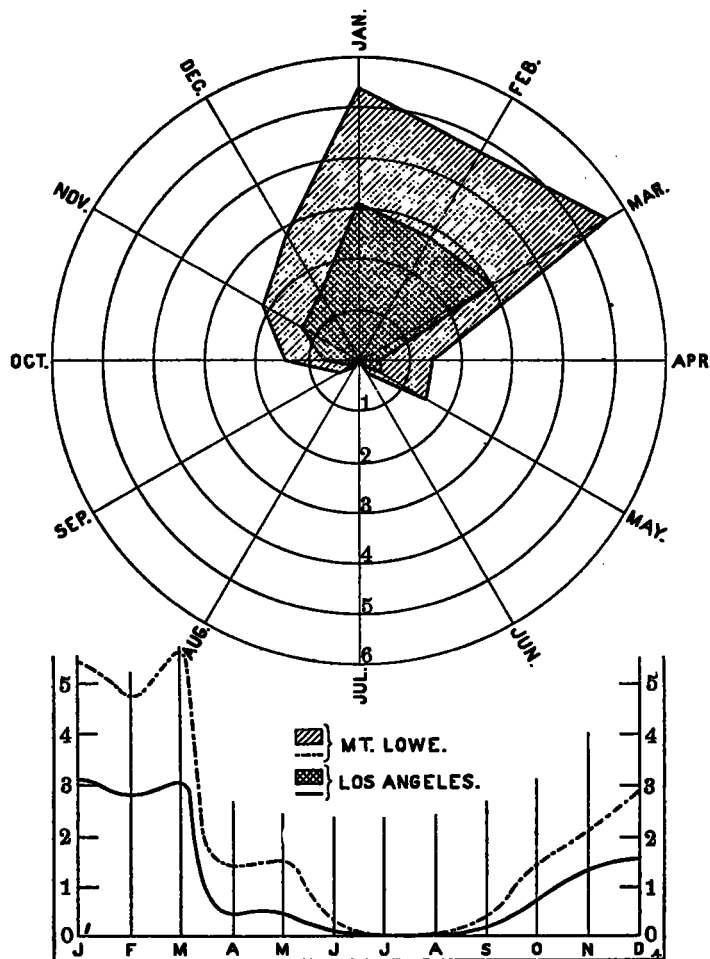


Table of average precipitation at Los Angeles (418 feet) and Mount Lowe, Cal. (5,480 feet), for the 17 complete years 1896-1908, inclusive, and 1904-1913, inclusive (inches).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mount Lowe....	5.43	4.78	5.66	1.41	1.46	0.31	0.01	0.09	0.39	1.43	2.14	2.87	25.98
Los Angeles....	3.08	2.82	3.03	0.42	0.47	0.08	0.01	0.02	0.17	0.71	1.27	1.82	13.60

FIG. 1.—Diagrams and table of annual march of average precipitation at Mount Lowe (5,480 ft.) and Los Angeles, Cal. (alt. 412 ft., A. S. L., 151 ft. above ground.)

¹ The author desires to acknowledge courteous assistance rendered by the local officers of the U. S. Corps of Engineers, the U. S. Forest Service, the manager California Fruit Exchange, and many individuals who contributed precipitation data.